

**WHAT IS CLAIMED IS:**

1           1. A highly efficient method for transducing stem cells with a vector  
2 particle containing a gene of interest, which method comprises contacting target stem cells  
3 with vector particles pseudotyped with feline endogenous virus RD114 envelope protein and  
4 containing a gene of interest, wherein the vector particles are substantially free of factors that  
5 induce stem cell differentiation.

1           2. The method of claim 1, wherein the vector particle is a retroviral vector  
2 particle comprising a modified retroviral genome containing the gene of interest.

1           3. The method of claim 2, wherein the retroviral vector particles are freed  
2 of factors that induce stem cell differentiation by being substantially free of producer cells and  
3 producer cell supernatant.

1           4. The method of claim 3, wherein the retroviral particles are pre-adsorbed  
2 onto a surface that promotes adherence of the retroviral particles.

1           5. The method of claim 4, wherein the surface is coated with an adherence  
2 promoting agent.

1           6. The method of claim 5, wherein the adherence promoting agent is  
2 retronectin.

1           7. The method of claim 2, wherein the retroviral particles are freed of  
2 producer cells and producer cell supernatant by ultracentrifugation.

1                   8.     The method of claim 2 wherein the retroviral particle is an oncoviral  
2     particle.

1                   9.     The method of claim 2 wherein the retroviral particle is a lentiviral  
2     particle.

1                   10.    The method of claim 1 wherein the target stem cells are pre-stimulated.

1                   11.    The method of claim 10, wherein the target stem cells are prestimulated  
2     by treatment with signaling molecules selected from the group consisting of cytokines, growth  
3     factors and phytohemagglutinin.

1                   12.    The method of claim 1 wherein the target stem cells are hematopoietic  
2     stem cells.

1                   13.    The method of claim 12 wherein the target hematopoietic stem cells are  
2     selected from the group consisting of cord blood cells, mobilized peripheral blood cells, bone  
3     marrow cells, and liver.

1                   14.    The method of claim 13, wherein the target hematopoietic stem cells  
2     are selected from the group consisting of CD34<sup>+</sup> cells and CD34<sup>+</sup> CD38<sup>-</sup> cells.

1                   15.    The method according to claim 2, wherein upon engraftment of the  
2     transduced stem cells contacted one time with the retroviral particles into a host, greater than  
3     10% of the transduced cells express the gene of interest.

1                   16.    The method according to claim 15, wherein greater than about 40%  
2     of the transduced cells express the gene of interest.

1           17. A population of stem cells transduced with vector particles  
2 pseudotyped with feline endogenous virus RD114 envelope protein and containing a gene of  
3 interest, wherein the population of stem cells are substantially undifferentiated.

18. The population of stem cells of claim 17, wherein the vector particle  
is a retroviral particle comprising a modified retroviral genome containing the gene of interest.

1           19. The population of stem cells of claim 18, wherein upon engraftment  
2 of the stem cells into a host, the number of stem cells in the host that express the gene of  
3 interest is greater than 10% times a number of exposures of the stem cells to the retroviral  
4 vector particles.

1           20. The population of stem cells of claim 18, wherein the stem cells  
2 were transduced by a single exposure to the retroviral vector particles and upon engraftment  
3 of the stem cells into a host, greater than about 40% of the stem cells express the gene of  
4 interest.

1           21. A method for introducing a gene of interest into a host, which  
2 method comprises introducing the transduced stem cells of claim 17 into a host.

1           22. The method according to claim 21, wherein the host is a human and  
2 the stem cells are human stem cells.

1           23. The method according to claim 21, wherein the host is an  
2 immunodeficient animal and the stem cells are human stem cells.

1           24. The method according to claim 21, wherein upon engraftment of the  
2 transduced stem cells contacted one time with the retroviral particles into a host, greater than  
3 10% of the transduced cells express the gene of interest.

1                   25. The method according to claim 24, wherein greater than about  
2          40% of the transduced stem cells express the gene of interest.

1                   26. A method of treating a disease or disorder, which method  
2          comprises administering to a patient a therapeutically effective dose of the transduced stem  
3          cells of claim 17, wherein the gene of interest is a therapeutic gene.

1                   27. The method of claim 26, wherein the disease or disorder is  
2          selected from the group consisting of hematopoietic disease, neural disease, joint-related  
3          disease, muscular disease, and liver disease.

1                   28. A non-human animal engrafted with the stem cells of claim 17.

1                   29. The non-human animal of claim 28, which is an immunodeficient  
2          mouse.

1                   30. The non-human animal of claim 28, which is a monkey.

1                   31. A kit comprising retroviral vector particles pseudotyped with feline  
2          endogenous virus RD114 envelope protein and containing a gene of interest their genome pre-  
3          adsorbed onto a surface that promotes adherence of the retroviral particles, wherein the  
4          retroviral vector particles are substantially free of producer cells and producer cell  
5          supernatant.

1                   32. The kit of claim 31, wherein the surface is coated with an adherence  
2          promoting agent.

1                   33. The kit of claim 32, wherein the adherence promoting agent is  
2                   retronectin.

1                   34. A method for preparing a kit comprising retroviral vector particles  
2                   pseudotyped with feline endogenous virus RD114 envelope protein and containing a gene of  
3                   interest their genome pre-adsorbed onto a surface that promotes adherence of the retroviral  
4                   particles, wherein the retroviral vector particles are substantially free of producer cells and  
5                   producer cell supernatant, which method comprises contacting the surface with the retroviral  
6                   vector particles for a sufficient period of time to permit adherence of the retroviral particles to  
7                   the surface, and removing supernatant in which the retroviral particles were suspended from  
8                   the surface.

1                   35. The method of claim 34, wherein the surface is coated with an  
2                   adherence promoting agent.

1                   36. The method of claim 35, wherein the adherence promoting agent is  
2                   retronectin.

1                   37. The method of claim 34, further comprising storing the retroviral  
2                   particles adsorbed onto the surface at -70°C.